

Appl. No. 10/065,430
Amdt. dated April 08, 2005
Reply to Office action of January 13, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 5 Claim 1 (Currently Amended): A thermal module for dissipating heat in a laptop computer, the thermal module comprising:
a heat pipe for rapidly transferring heat;
a heat absorber disposed at one end of the heat pipe for absorbing heat from an electrical component;
- 10 a heat storage disposed at another end of the heat pipe for storing excess heat, the heat storage comprising a ~~plurality of types of~~ first phase change material and a second phase change material for heat storage ~~that change by changing~~ from one physical state to another physical state at differing temperatures a first and second temperature respectively; and
- 15 a heat dissipater disposed at one section of the heat pipe between the heat absorber and the heat storage;
wherein the first temperature is different from the second temperature and both the first and the second temperatures are lower than a third temperature that is capable of damaging the electrical component.
- 20
- Claim 2 (Original): The thermal module of claim 1 wherein the heat storage is fixed flush against all surfaces contacting the heat pipe.
- Claim 3 (Original): The thermal module of claim 1 wherein the heat storage is fixed flush
- 25 against all surfaces contacting the heat dissipation region.
- Claim 4 (Original): The thermal module of claim 1 wherein the heat storage comprises a

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casing.

Claim 5 (Original): The thermal module of claim 4 wherein the casing is flexible.

- 5 Claim 6 (Original): The thermal module of claim 4 wherein the casing comprises an electrically insulating layer.

Claim 7 (Original): The thermal module of claim 4 wherein the casing comprises a thermally insulating layer.

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Claim 8 (Currently Amended): The thermal module of claim 6 wherein the first and second phase change materials are disposed within the casing.

- 15 Claim 9 (Currently Amended): The thermal module of claim 8 wherein the ~~at least one phase change material is~~ first and second phase change materials are selected from the group consisting of wax, water, neopentyl glycol (NPG), and $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.

Claims 10-13 (Cancelled)

- 20 Claim 14 (Currently Amended): A thermal module for dissipating heat in a laptop computer, the thermal module comprising:
a heat generating electrical component;
a heat sink capable of dissipating a predefined reasonable thermal target quantity of heat corresponding to a predefined temperature;
25 a heat pipe for transferring heat from the heat generating electrical component to the heat sink, one end of the heat pipe being in thermal contact with the heat generating electrical component, a section of the heat pipe being in thermal contact with the heat sink; and
a heat storage device disposed at another end of the heat pipe so that the heat sink is

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5 between the heat storage device and the heat generating electrical component, the
heat storage device comprising an electrically insulating casing and a first phase
change material and a second phase change material confined within the casing,
the first phase change material changing from one physical state to another
physical state at ~~approximately~~ the predefined temperature, the second phase
10 change material changing from one physical state to another physical state at a
temperature different than the predefined temperature and less than a temperature
capable of damaging the electrical component, the heat storage device disposed
in flush thermal contact with the heat pipe such that when the heat pipe transfers
a quantity of heat from the heat generating electrical component to the heat sink
15 in excess of the ~~reasonable~~ thermal target, the heat storage device absorbs and
stores the excess heat.

Claim 15 (Currently Amended): A thermal module for dissipating heat in a laptop
15 computer, the thermal module comprising:
a heat pipe;
a heat generating electrical component in thermal contact with one end of the heat
pipe;
20 a heat storage device in thermal contact with another end of the heat pipe, the heat
storage device comprising a thermally and electrically insulating casing at least
partially enclosing a first phase change material, the first phase change material
changing from solid state to a liquid state at ~~approximately~~ a first predefined
temperature; and
25 a heat sink in thermal contact with the heat pipe between the electrical component
and the heat storage device and not in direct physical contact with the heat
storage device, the heat sink of a predetermined size maximally capable of
continuously dissipating a predefined ~~reasonable~~ thermal target quantity of heat
at the first predefined temperature, the ~~reasonable~~ thermal target being less than a
maximum quantity of heat generated by the electrical component under operating

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conditions;

wherein the heat storage device extends into gaps between electrical components of the laptop computer.

- 5 Claim 16 (Currently Amended): The thermal module of claim 15 wherein the thermally and electrically insulating casing further at least partially encloses a second phase change material, the second phase change material changing from solid state to a liquid state at ~~approximately~~ a second predefined temperature, the second predefined temperature being different than the first predefined temperature and less than a
10 temperature corresponding to a maximum quantity of heat generated by the electrical component under operating conditions.

- Claim 17 (Currently Amended) The thermal module of claim ~~[[15]]~~ 16 wherein the first phase change material is and the second phase change material are selected from the
15 group consisting of wax, water, neopentyl glycol (NPG), and $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.

Claim 18 (New) The thermal module of claim 14 wherein the first phase change material and the second phase change material are selected from the group consisting of wax, water, neopentyl glycol (NPG), and $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.

- 20 Claim 19 (New) The thermal module of claim 14 wherein the heat storage device is not in direct physical contact with the heat sink.